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Electronic Components Sourcing Information

Product Reference Information

Part Number:	BUK4D16-20X
Manufacturer:	Nexperia USA Inc.
Package:	Please confirm with sales
Availability:	Please confirm with sales

Product Page:

<https://antrexco.com/product/details/nexperia-usa-inc/buk4d16-20x.html>

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Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



BUK4D16-20

20 V, N-channel Trench MOSFET

29 March 2021

Product data sheet

1. General description

N-channel enhancement mode Field-Effect Transistor (FET) in a medium power DFN2020MD-6 (SOT1220) Surface-Mounted Device (SMD) plastic package using Trench MOSFET technology.

2. Features and benefits

- Extended temperature range $T_j = 175\text{ °C}$
- Side wettable flanks for optical solder inspection
- ElectroStatic Discharge (ESD) protection $> 2\text{ kV HBM (class H2)}$
- Trench MOSFET technology
- AEC-Q101 qualified

3. Applications

- DC to DC conversion
- High-speed line driver
- Low-side load switch
- Switching circuits

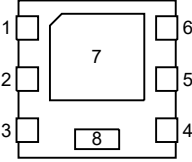
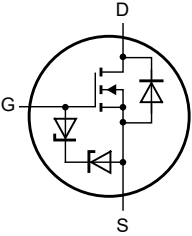
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DS}	drain-source voltage	$T_j = 25\text{ °C}$	-	-	20	V
V_{GS}	gate-source voltage		-12	-	12	V
I_D	drain current	$V_{GS} = 4.5\text{ V}; T_{sp} = 25\text{ °C}$	-	-	26	A
P_{tot}	total power dissipation	$T_{sp} = 25\text{ °C}$	-	-	19	W
Static characteristics						
R_{DSon}	drain-source on-state resistance	$V_{GS} = 4.5\text{ V}; I_D = 8.5\text{ A}; T_j = 25\text{ °C}$	-	13	16	mΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	D	drain	 Transparent top view DFN2020MD-6 (SOT1220)	 017aaa255
2	D	drain		
3	G	gate		
4	S	source		
5	D	drain		
6	D	drain		
7	D	drain		
8	S	source		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BUK4D16-20	DFN2020MD-6	plastic, leadless thermal enhanced ultra thin small outline package with side-wettable flanks (SWF); 6 terminals; 0.65 mm pitch; 2 mm x 2 mm x 0.65 mm body	SOT1220

7. Marking

Table 4. Marking codes

Type number	Marking code
BUK4D16-20	6L

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V _{DS}	drain-source voltage	T _j = 25 °C		-	20	V
V _{GS}	gate-source voltage			-12	12	V
I _D	drain current	V _{GS} = 4.5 V; T _{sp} = 25 °C		-	26	A
		V _{GS} = 4.5 V; T _{sp} = 100 °C		-	17	A
		V _{GS} = 4.5 V; T _{amb} = 25 °C	[1]	-	8.5	A
I _{DM}	peak drain current	T _{sp} = 25 °C; single pulse; t _p ≤ 10 μs		-	106	A
P _{tot}	total power dissipation	T _{sp} = 25 °C		-	19	W
		T _{amb} = 25 °C	[1]	-	2	W
T _j	junction temperature			-55	175	°C
T _{amb}	ambient temperature			-55	175	°C
T _{stg}	storage temperature			-65	175	°C
Source-drain diode						
I _S	source current	T _{sp} = 25 °C		-	19	A
		T _{amb} = 25 °C	[1]	-	2	A
I _{SM}	peak source current	single pulse; t _p ≤ 10 μs; T _{sp} = 25 °C		-	75	A
ESD maximum rating						
V _{ESD}	electrostatic discharge voltage	HBM	[2]	-	2000	V
Avalanche ruggedness						
E _{DS(AL)S}	non-repetitive drain-source avalanche energy	T _{j(init)} = 25 °C; I _D = 1.3 A; DUT in avalanche (unclamped)		-	13	mJ

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and mounting pad for drain 6 cm².

[2] Measured between all pins.

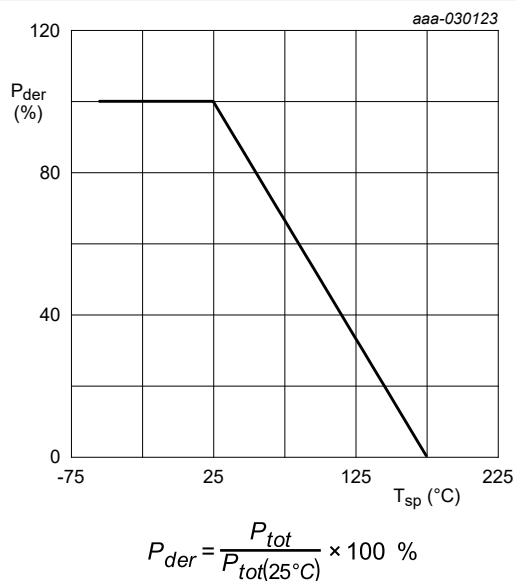


Fig. 1. Normalized total power dissipation as a function of solder point temperature

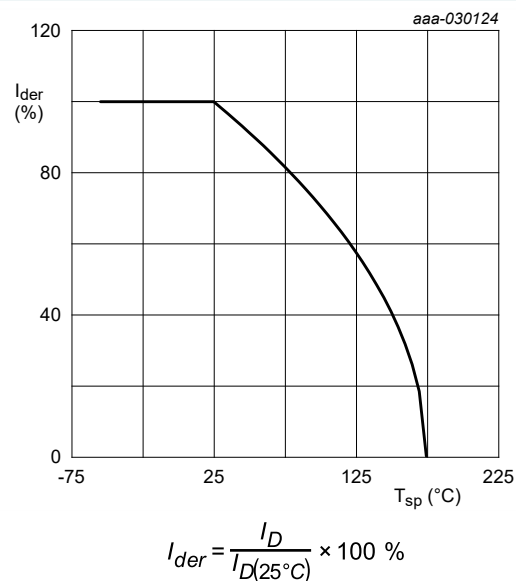
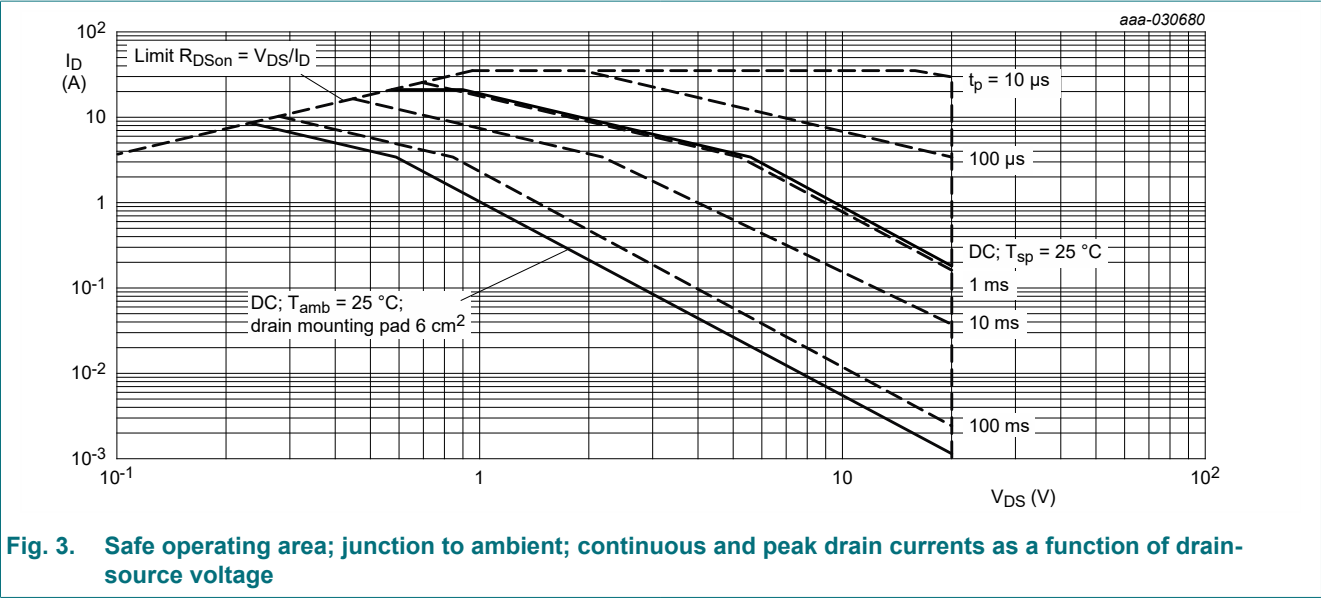


Fig. 2. Normalized continuous drain current as a function of solder point temperature



9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	66	76	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	4	8	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for drain 6 cm².

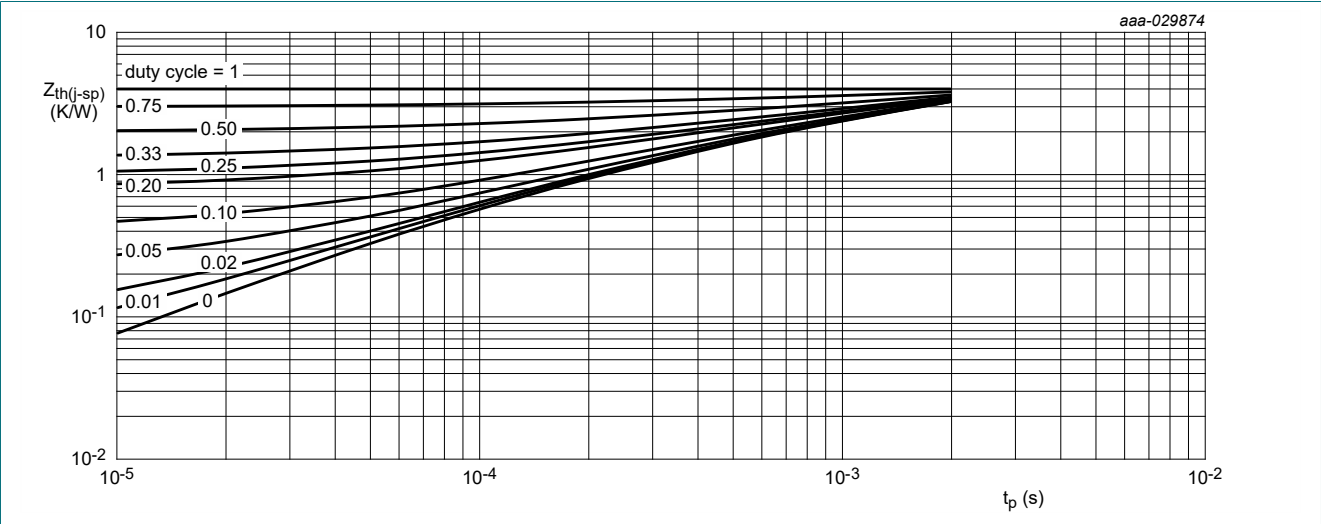


Fig. 4. Transient thermal impedance from junction to solder point as a function of pulse duration; typical values

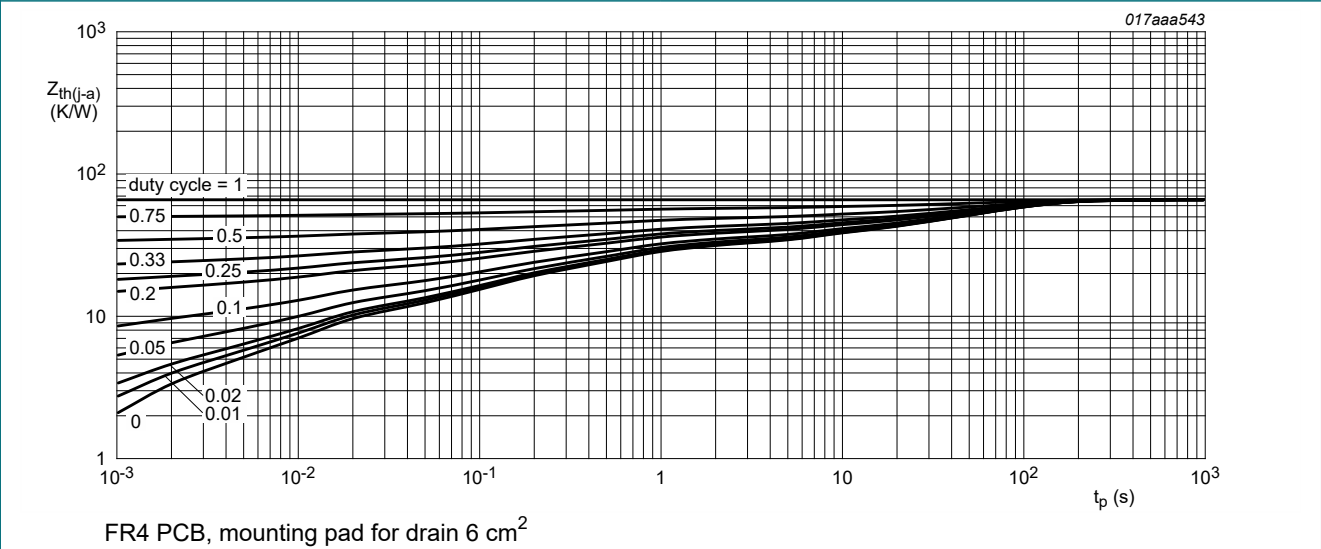


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 250 μA; V _{GS} = 0 V; T _j = 25 °C		20	-	-	V
V _{GSth}	gate-source threshold voltage	I _D = 250 μA; V _{DS} = V _{GS} ; T _j = 25 °C		0.6	0.95	1.3	V
I _{DSS}	drain leakage current	V _{DS} = 0 V; V _{GS} = 0 V; T _j = 25 °C		-	-	1	μA
		V _{DS} = 20 V; V _{GS} = 0 V; T _j = 125 °C		-	-	20	μA
I _{GSS}	gate leakage current	V _{GS} = 12 V; V _{DS} = 0 V; T _j = 25 °C		-	-	10	μA
		V _{GS} = -12 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-10	μA
		V _{GS} = 4.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	2	μA
		V _{GS} = -4.5 V; V _{DS} = 0 V; T _j = 25 °C		-	-	-2	μA
R _{DSon}	drain-source on-state resistance	V _{GS} = 8 V; I _D = 9 A; T _j = 25 °C		-	11	14	mΩ
		V _{GS} = 8 V; I _D = 9 A; T _j = 175 °C		-	19	24	mΩ
		V _{GS} = 4.5 V; I _D = 8.5 A; T _j = 25 °C		-	13	16	mΩ
		V _{GS} = 2.5 V; I _D = 3 A; T _j = 25 °C		-	17	25	mΩ
g _{fs}	forward transconductance	V _{DS} = 10 V; I _D = 8.5 A; T _j = 25 °C		-	14.4	-	S
R _G	gate resistance	f = 1 MHz		-	1.4	-	Ω
Dynamic characteristics							
Q _{G(tot)}	total gate charge	V _{DS} = 10 V; I _D = 9 A; V _{GS} = 4.5 V; T _j = 25 °C		-	9.8	15	nC
Q _{GS}	gate-source charge			-	1.5	-	nC
Q _{GD}	gate-drain charge			-	2.9	-	nC
C _{iss}	input capacitance	V _{DS} = 10 V; f = 1 MHz; V _{GS} = 0 V; T _j = 25 °C		-	931	-	pF
C _{oss}	output capacitance			-	144	-	pF
C _{rss}	reverse transfer capacitance			-	121	-	pF
t _{d(on)}	turn-on delay time	V _{DS} = 10 V; I _D = 9 A; V _{GS} = 4.5 V; R _{G(ext)} = 6 Ω; T _j = 25 °C		-	4	-	ns
t _r	rise time			-	7	-	ns
t _{d(off)}	turn-off delay time			-	15	-	ns
t _f	fall time			-	9	-	ns
Source-drain diode							
V _{SD}	source-drain voltage	I _S = 2 A; V _{GS} = 0 V; T _j = 25 °C		-	0.7	1.2	V
t _{rr}	reverse recovery time	I _S = 2 A; dI _S /dt = -100 A/μs; V _{GS} = 0 V; V _{DS} = 10 V; T _j = 25 °C		-	10	-	ns
Q _r	recovered charge			-	3	-	nC

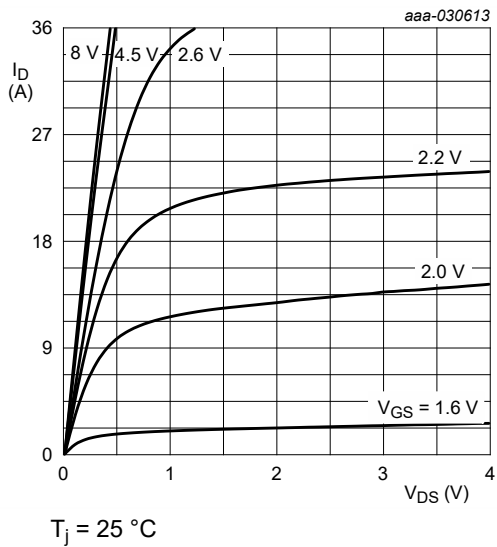


Fig. 6. Output characteristics: drain current as a function of drain-source voltage; typical values

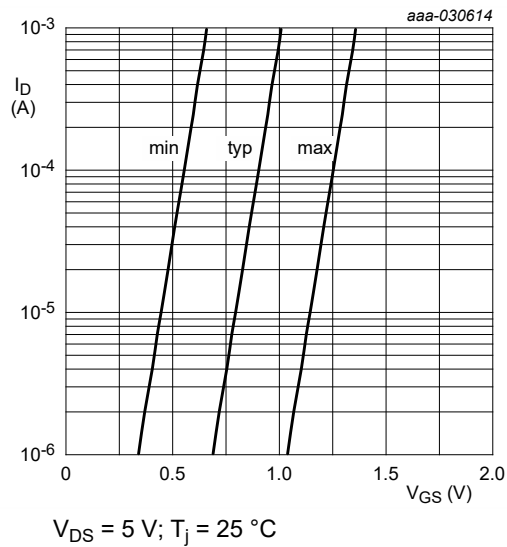


Fig. 7. Sub-threshold drain current as a function of gate-source voltage

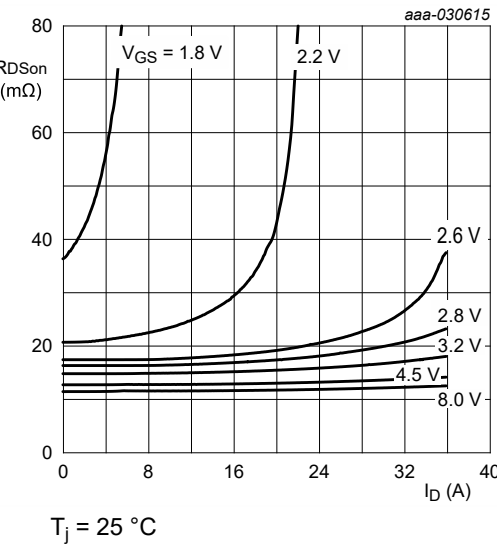


Fig. 8. Drain-source on-state resistance as a function of drain current; typical values

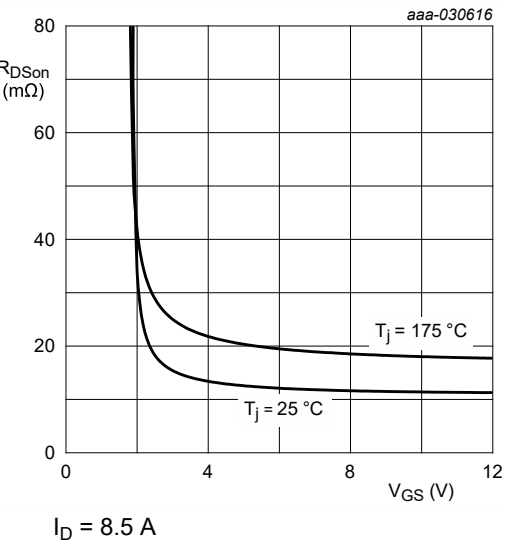


Fig. 9. Drain-source on-state resistance as a function of gate-source voltage; typical values

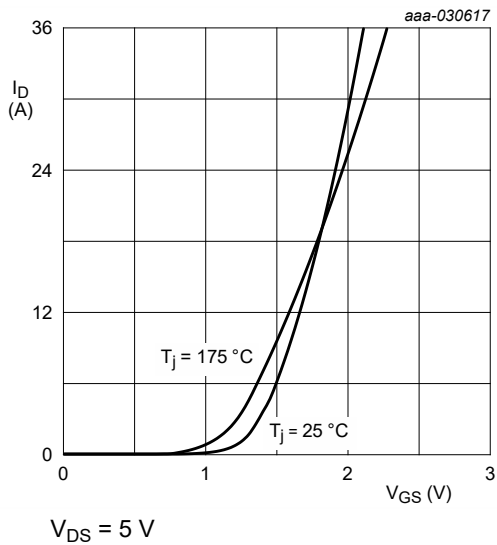


Fig. 10. Transfer characteristics: drain current as a function of gate-source voltage; typical values

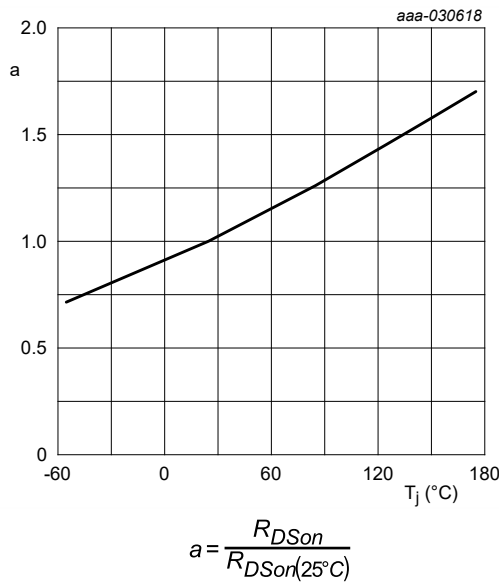


Fig. 11. Normalized drain-source on-state resistance as a function of junction temperature; typical values

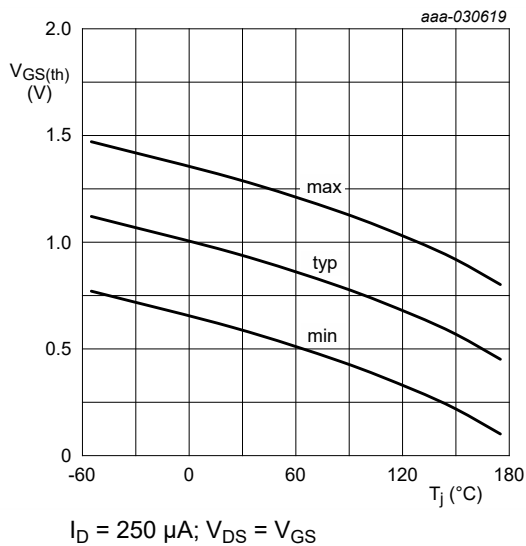


Fig. 12. Gate-source threshold voltage as a function of junction temperature

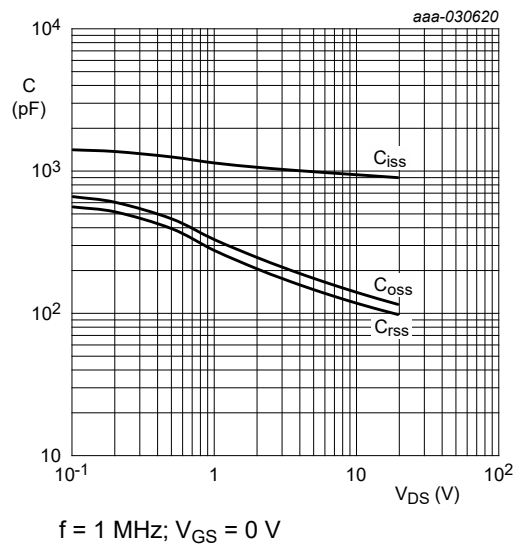


Fig. 13. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values

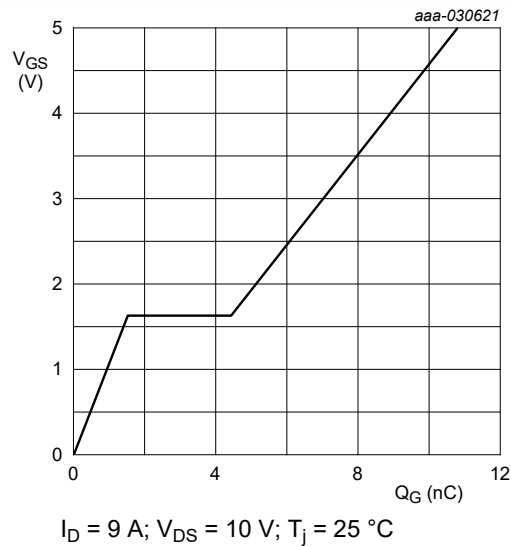


Fig. 14. Gate-source voltage as a function of gate charge; typical values

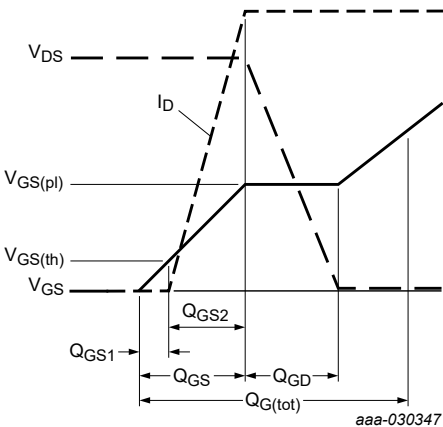
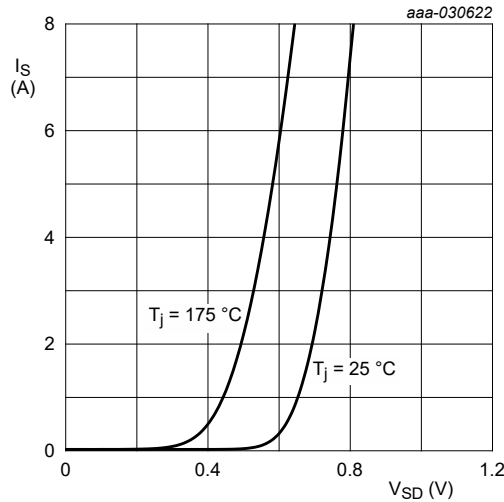


Fig. 15. Gate charge waveform definitions



$V_{GS} = 0\text{ V}$

Fig. 16. Source current as a function of source-drain voltage; typical values

11. Test information

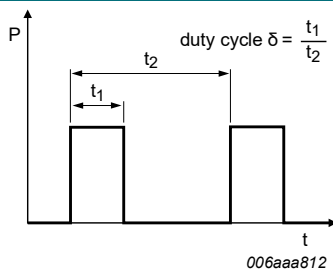


Fig. 17. Duty cycle definition

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

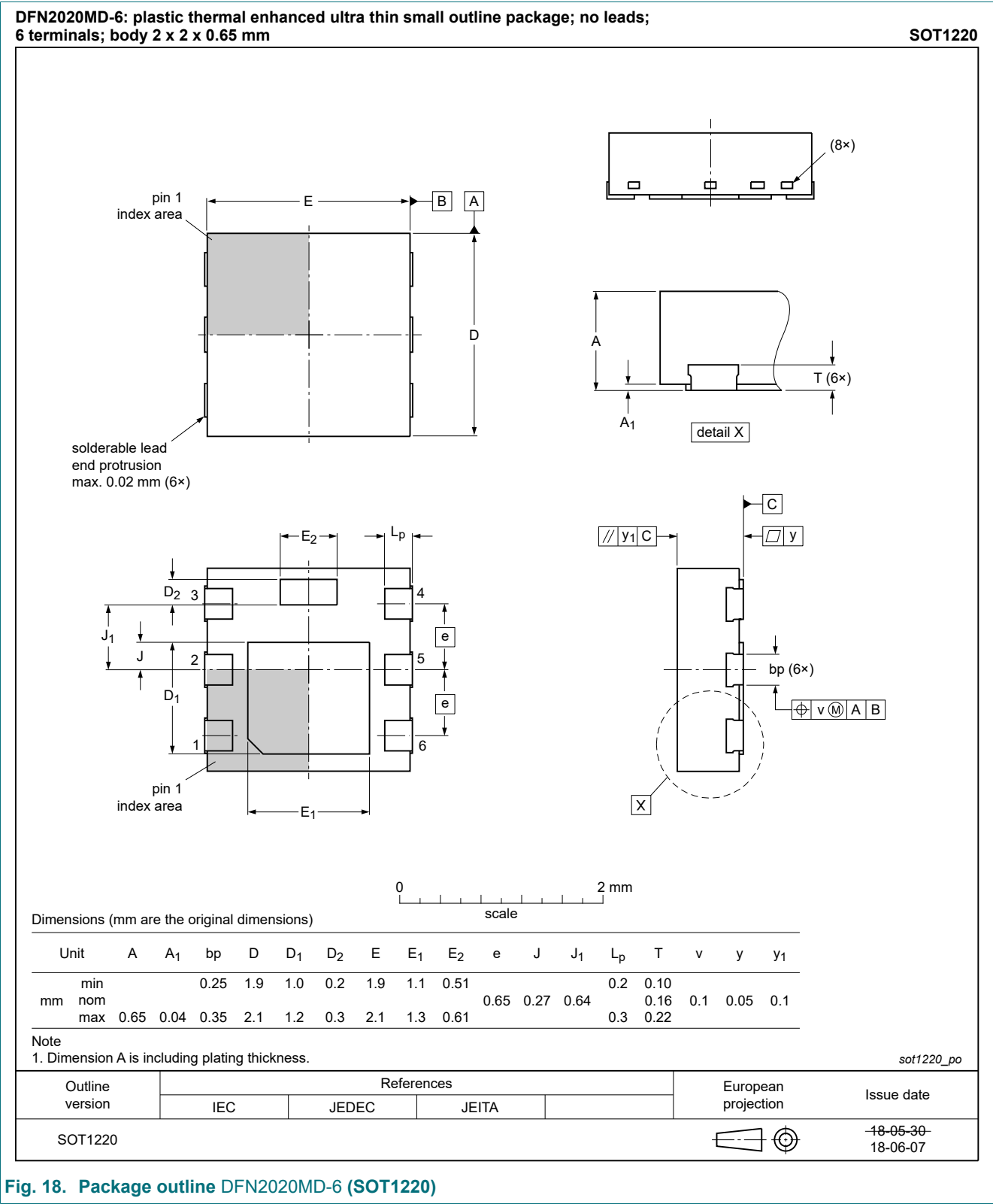
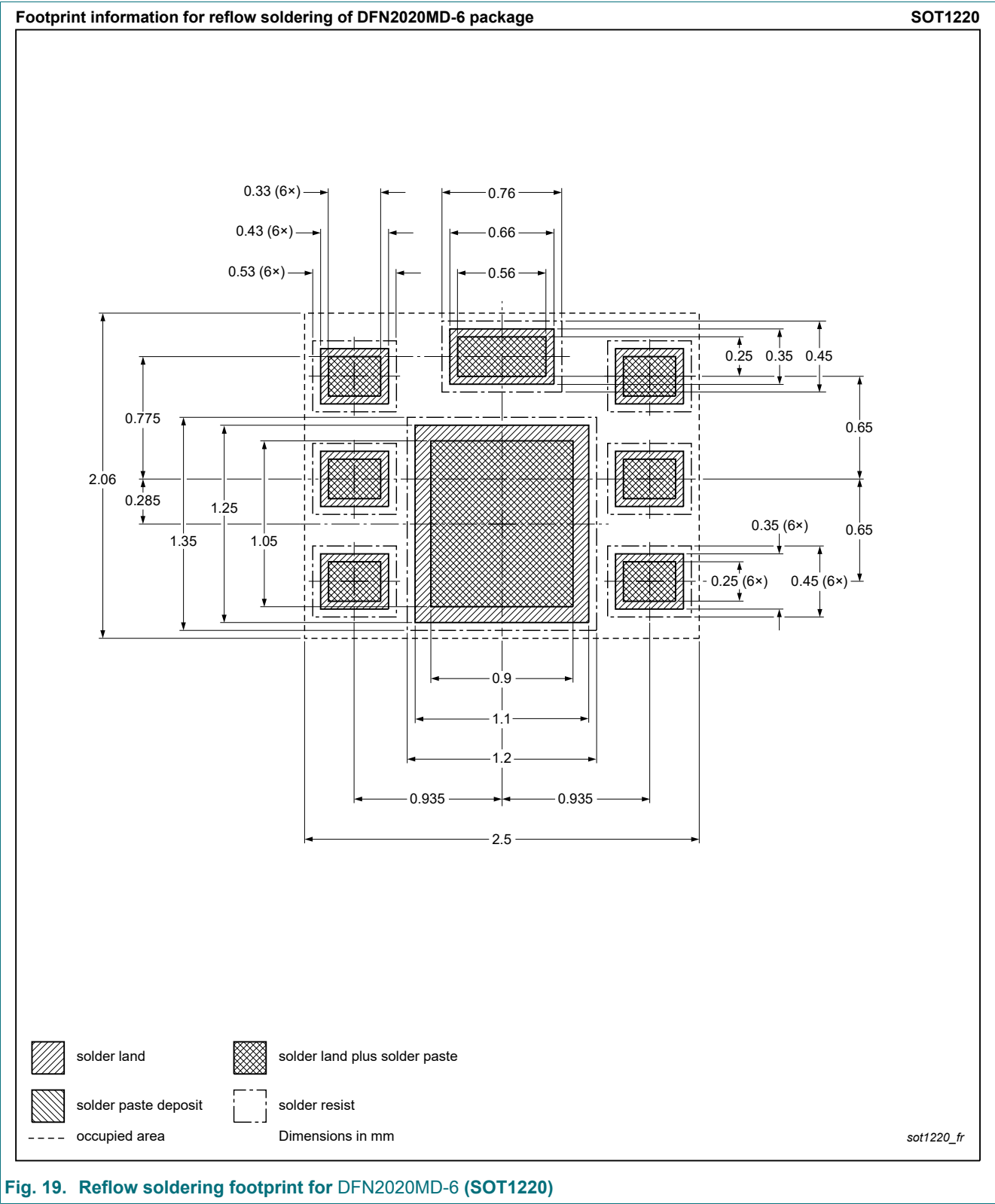


Fig. 18. Package outline DFN2020MD-6 (SOT1220)

13. Soldering



14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BUK4D16-20 v.3	20210329	Product data sheet	-	BUK4D16-20 v.2
Modifications:	• Chapter "Characteristics": Typo correction at parameter R_{DSon}			
BUK4D16-20 v.2	20200709	Product data sheet	-	BUK4D16-20 v.1
BUK4D16-20 v.1	20200114	Objective data sheet	-	-

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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